

NASA Aeronautics: The Future of Flight

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STEM Integration Lead

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NASA Aeronautics— The first “A” in NASA

- NASA Aeronautics has made contributions to aviation for decades.
- Every US commercial aircraft and air traffic tower has NASA-developed technology
- NASA’s aeronautics research is focused on the future of aviation
- This includes:
 - Quiet, supersonic flight over land
 - Future Airspace
 - Sustainable Aviation
 - Advanced Air Mobility



QUIET SUPERSONIC FLIGHT OVER LAND



FUTURE AIRSPACE



SUSTAINABLE AVIATION

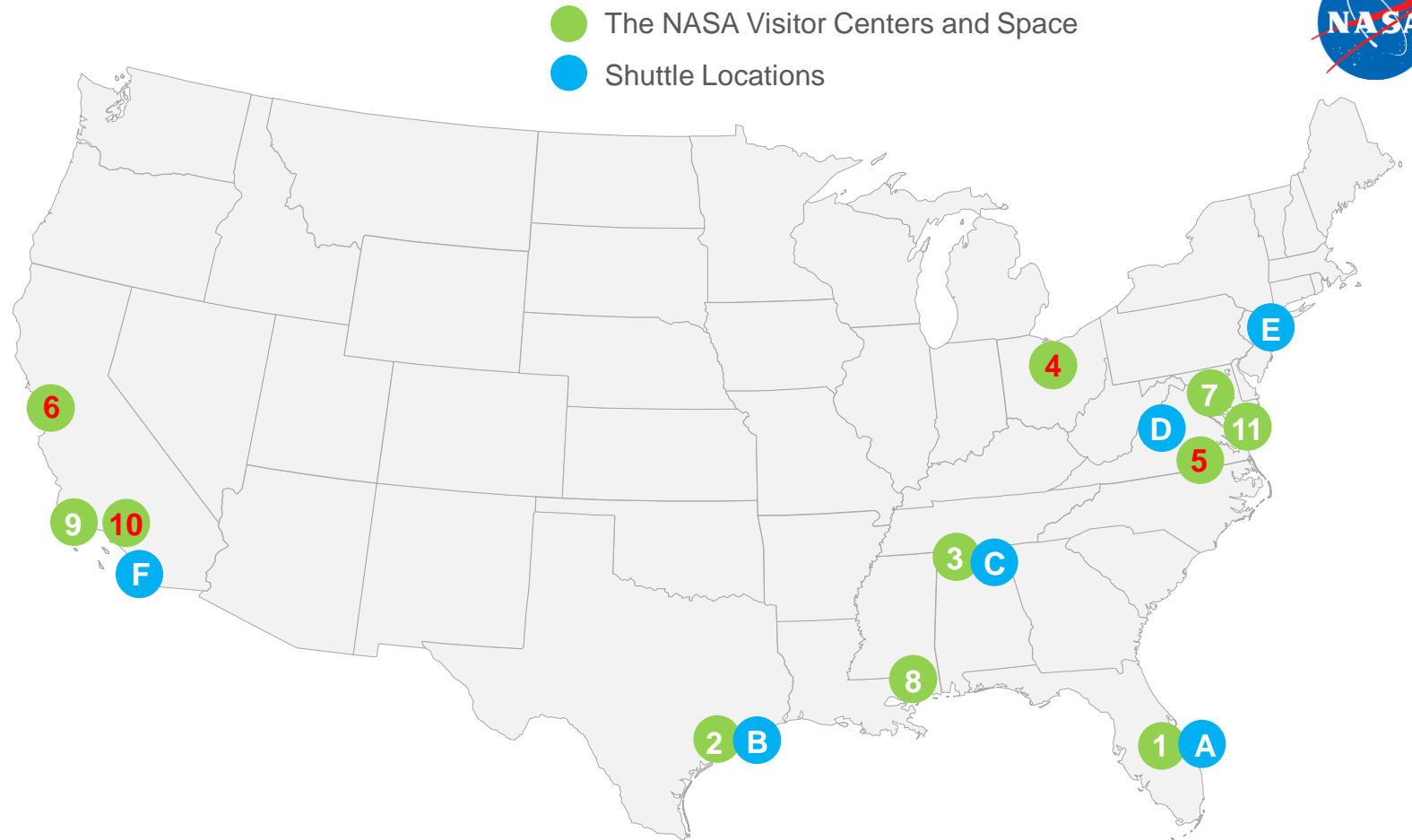


ADVANCED AIR MOBILITY

NASA Centers and a focus on Aeronautics

NASA Aero Research Centers:

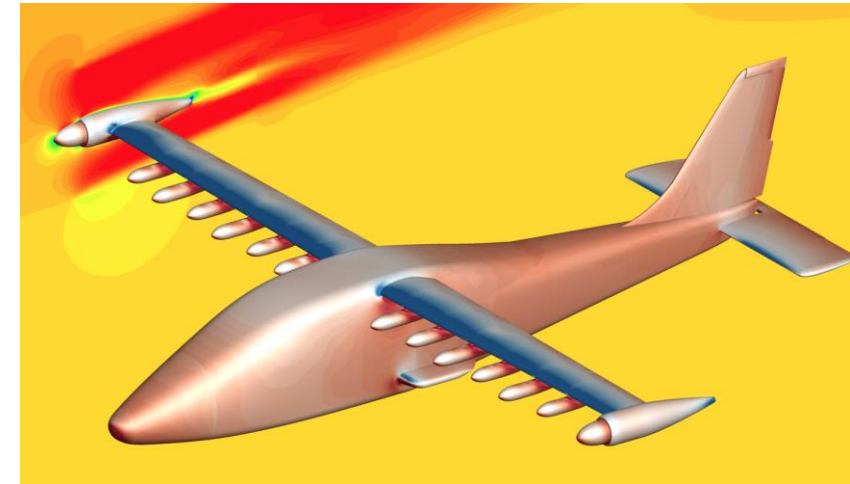
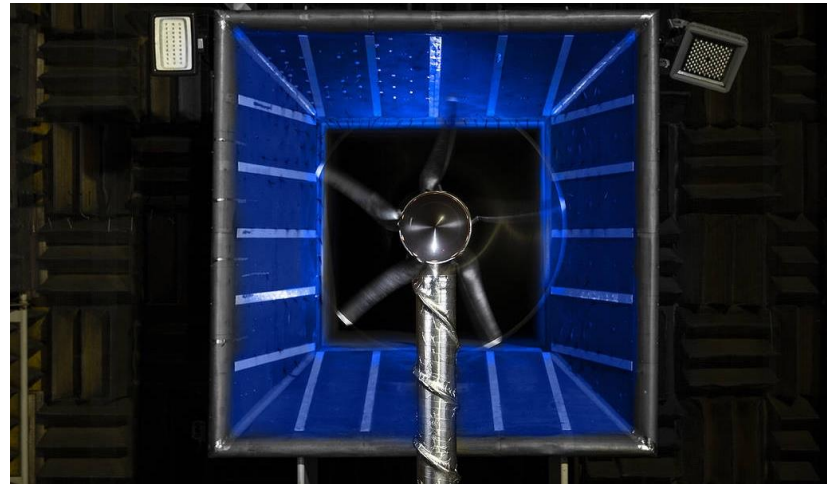
- Ames Research Center – CA
- Armstrong Flight Research Center–CA
- Glenn Research Center–OH
- Langley Research Center–VA



- | | |
|---|---|
| 1 A Kennedy Space Center–Florida | 8 INFINITY Science Center–Mississippi |
| 2 B Space Center Houston–Texas | 9 Jet Propulsion Laboratory–California |
| 3 C US Space & Rocket Center–Alabama | 10 Armstrong Flight Research Center–California |
| 4 Great Lakes Science Center–Ohio | 11 Wallops Flight Facility–Virginia |
| 5 Virginia Air and Space Center–Virginia | D Smithsonian Udvar-Hazy Center–Virginia |
| 6 Ames Research Center–California | E Intrepid Sea-Air-Space Museum–New York |
| 7 Goddard Visitor Center–Maryland | F California Science Center–California |

Sustainable Aviation

- NASA's Aeronautics Research Mission Directorate focuses on technologies and systems that will shape aeronautics for decades to come
- Sustainability:
 - Quieter, more efficient engines
 - Quieting the "boom"
- Air traffic technologies and systems that allow more aircraft to safely and efficiently share airspace
- Reducing fuel consumption through
 - Electric propulsion
 - Better airspace systems



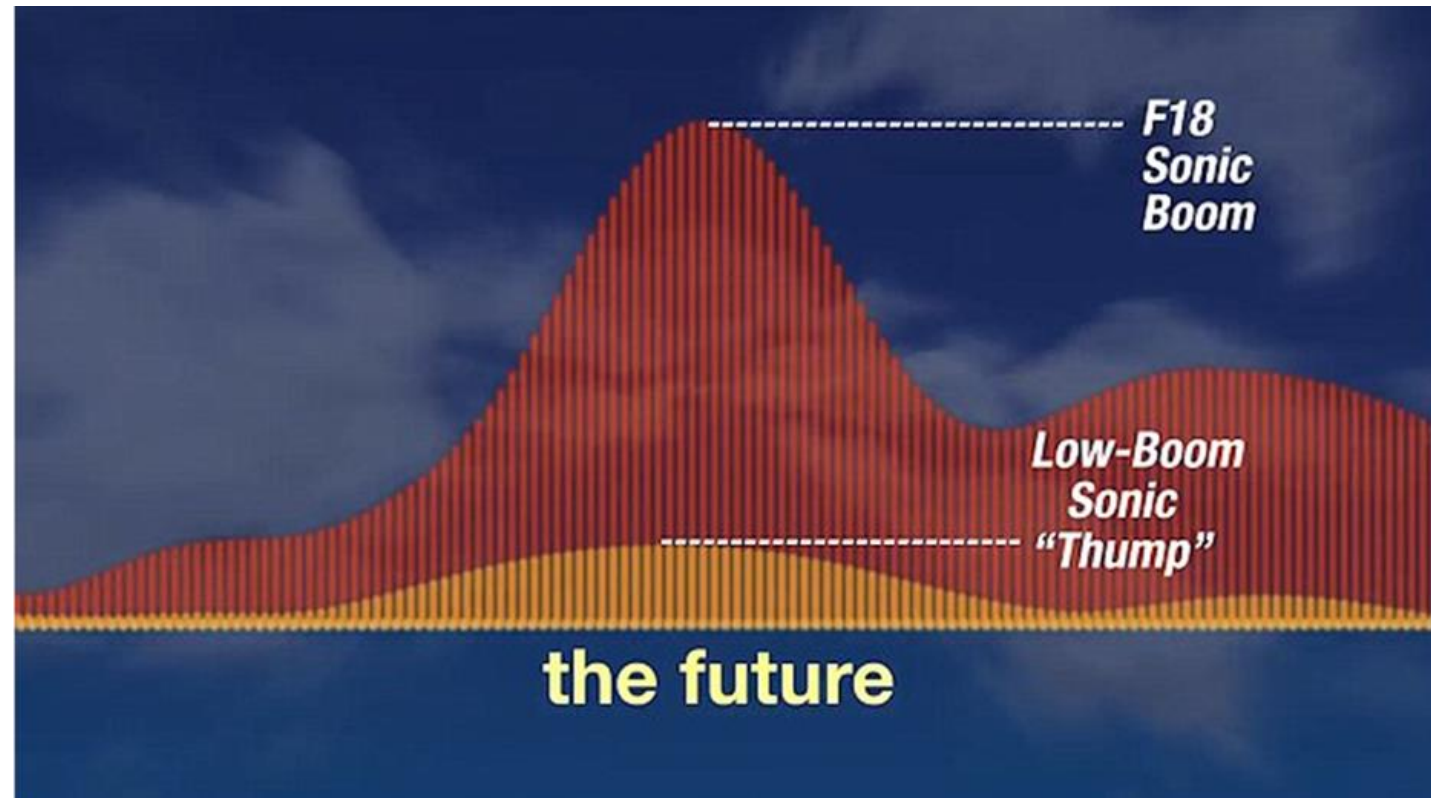
Return of the X-Planes

- <https://www.nasa.gov/centers/armstrong/images/X-Planes/index.html>
- NASA has been working on X planes since the 1940s
 - Many were designed to develop high speed flight
- First X-plane series was the X-1 (when NASA was NACA—National Advisory Committee for Aeronautics—with a goal to break the sound barrier)
- X-planes are designed to test technologies and designs
- Current X-planes include the X-57 Maxwell and X-59 QueSST
- Results of all X-plane programs will shape future aircraft, aircraft systems, or technologies



X-59 QueSST (Quiet SuperSonic Technology)

- First piloted X-plane in decades
- Will fly faster than the speed of sound over land
- Innovative technologies will reduce the “sonic boom” to a “sonic thump”
- X-59 will be flying over select cities to gather citizen science data
 - Data will be sent to officials with a goal of allowing supersonic transport over land



<https://www.nasa.gov/specials/X59/why-build-a-quiet-supersonic.html#maxwell>

<https://www.nasa.gov/specials/X59/>

LBFD Community Overflights

X-59 will be flying over select locations to gather citizen science data

- Data will be sent to officials with an overall goal of allowing supersonic transport over land

STEM and Community Engagement

Goals:

- Engage with communities around the country
- Build awareness and excitement of the benefits of NASA Aeronautics and aeronautics research
- Be good stewards in the communities we are impacting with our testing
- Connect NASA resources and career development opportunities to communities

STEM Engagement opportunities

- **Connect with schools and classrooms**
 - Provide STEM resources, interact with NASA education specialists and subject matter experts, increase awareness of continuous STEM engagement opportunities
 - School assemblies, classroom hands-on workshops, educator professional development workshops
- **Work with informal education locations (museums, libraries, science centers)**
 - Engage the community and build longer-term relationships after overflights have concluded
 - Hands-on workshops and activities, presentations, resources to build and support exhibits



X-57 Maxwell



- [Physics, Engineering Design, and the X-57 Maxwell Electric Airplane](#)
- Small, experimental aircraft powered by electricity
- 460-Volt battery, 14 electric motors and a specially-designed wing that is 42% of the original size
- Modified Tecnam P2006T aircraft
- Two wing-tip propellers reduce wing-tip vortex at cruise altitude
- Goal: prove that energy efficiency at cruising altitudes may reduce overall operating costs for small aircraft by 40%

<https://www.nasa.gov/specials/X57/index.html>



Advance Air Mobility (AAM): “Drones” in Society

- <https://www.nasa.gov/aam>
- Air taxis, drone cargo deliveries, revolutionary aircraft we don't even have yet
 - NASA is helping to develop new air transportation **systems** to move people and cargo
- NASA Aeronautics is not building the drones, or unmanned aircraft vehicles (UAVs) but is helping create the systems to help them fly safely and efficiently

NASA Aeronautics Education Resources

<https://www.nasa.gov/aeroresearch/resources>

Next Gen STEM: Aeronaut-X

<https://www.nasa.gov/stem/nextgenstem/aeronaut-x/index.html>

Aeronautics@Home

<https://www.nasa.gov/aero-at-home>

ARMD STEM MODULES

Advanced Air Mobility (AAM)

X-57

X-59

Aeronautics for Pre-K

<https://www.nasa.gov/sites/default/files/atoms/files/aero-prek.pdf>

Leveled Readers

<https://www.nasa.gov/aeroresearch/resources/leveled-readers>

Museum in a Box

<https://www.nasa.gov/aeroresearch/resources/museum-in-a-box>

Mini-Posters

<https://www.nasa.gov/aero/nasa-aero-lithographs.html>

Videos

<https://www.nasa.gov/topics/aeronautics/videos/index.html>



NASA Aeronautics: STEM Learning Modules

NASA Aeronautics STEM Learning Modules are collections of activities, videos, assessments, and more.

Each STEM Learning Module is focused on a STEM topic(s) tied to a real-world NASA mission or project (K-12 focus)

[X-57 Electric Airplane: STEM Module](#)

[Advanced Air Mobility \(AAM\): STEM Learning Module](#)

[X-59 Quiet Supersonic Flight: STEM Learning Module](#)



NASA Aeronautics Education Resources cont...

University Leadership Initiative

<https://nari.arc.nasa.gov/uli>

NASA's Educator Professional Development Collaborative

<https://www.txstate-epdc.net/>

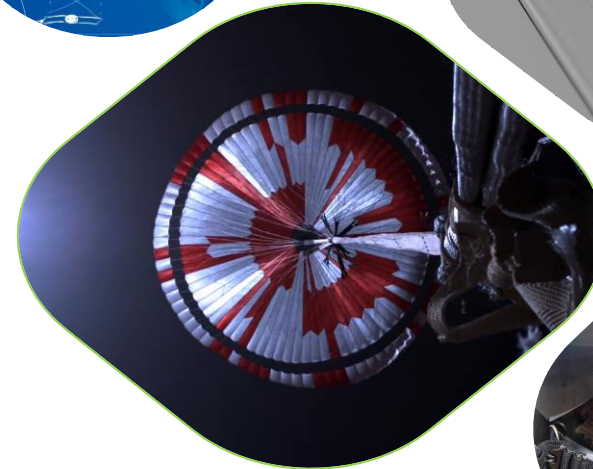
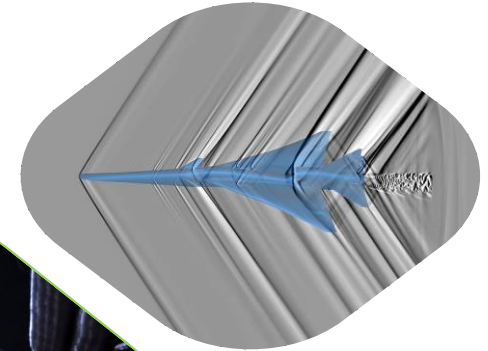
Museum and Informal Education Alliance (MIE)

<https://informal.jpl.nasa.gov/museum/>

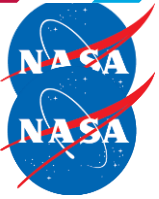
eBooks

https://www.nasa.gov/connect/ebooks/aeronautics_ebooks_archive_1.html

...and much more!

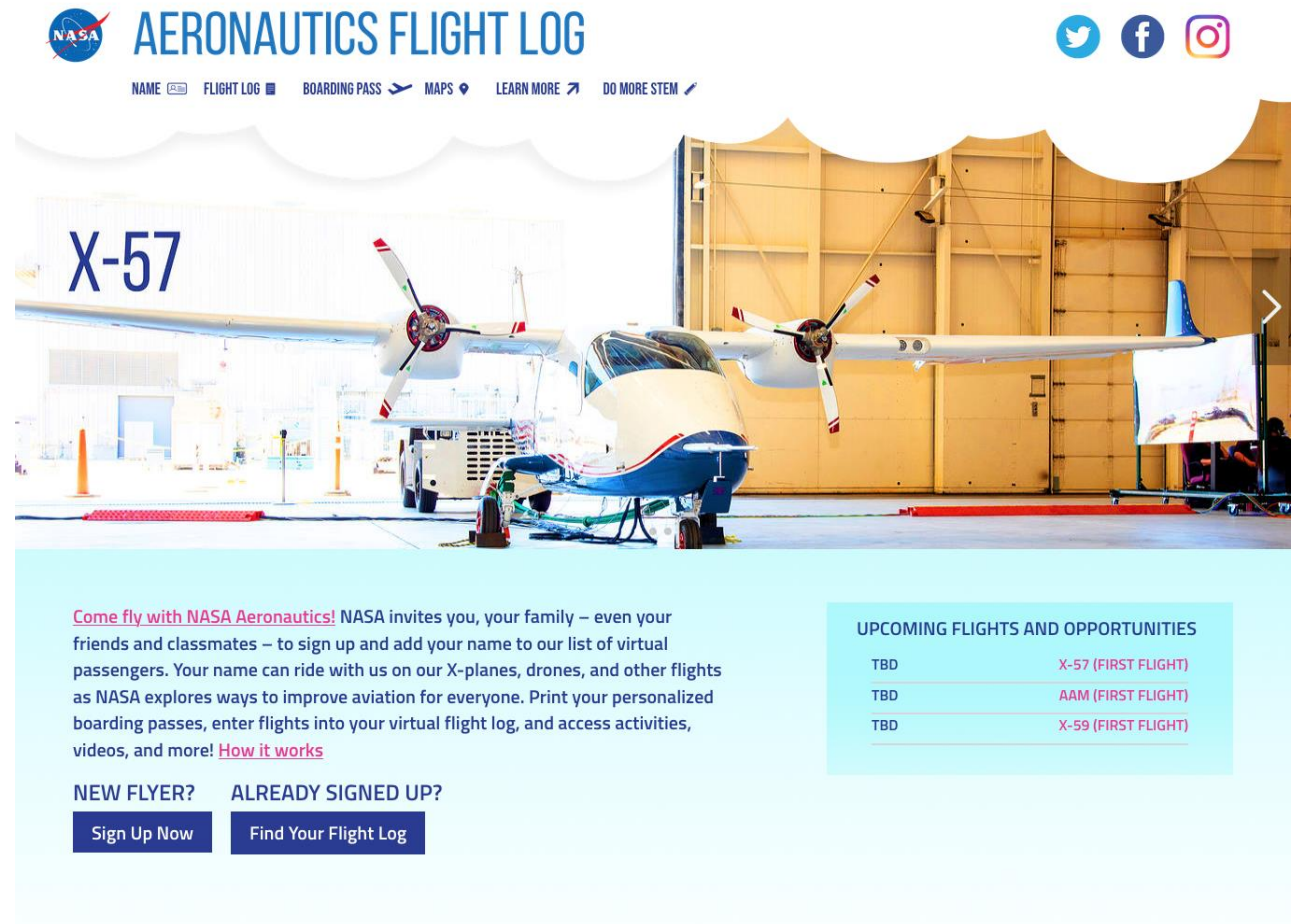


Flight Log Experience



- **First Access:** Send your name with NASA Aeronautics on our upcoming X-plane flights and more!
- Sign up now for NASA's Flight Log Experience
- Start building your virtual flight log.
- Fly with us, learn with us, and be a part of our research and exploration.
- Bring your entire class! Access STEM activities, videos and earn endorsements and virtual mission patches.

www.nasa.gov/flightlog





Shareable Boarding Passes

- Individuals or Classroom Flight Log/Boarding Passes
- Individual flight logs for students under 13 years old, parents/guardians need to create their accounts
- Boarding Passes are available as a link in the Flight Logs
- Information will automatically update as more flight information is available



AERONAUTICS FLIGHT LOG

NEW FREQUENT FLYER NUMBER: 0000000001

NAME

FLIGHT LOG

BOARDING PASS

MAPS

LEARN MORE

DO MORE STEM



FLIGHT LOG

ABOUT FLIGHT LOGS

ENDORSEMENTS

MISSION PATCHES

VIDEOS

| FLIGHT DATE | FLIGHT TIME/ DURATION | FLIGHT ROUTE | FLIGHT NUMBER | AIRCRAFT | WEATHER CONDITIONS | COMMENTS/OBSERVATIONS | PILOT IN COMMAND | CERTIFICATIONS/ SIGNATURES |
|-------------|---------------------------------|--------------|---------------|----------|--------------------|---|------------------|-------------------------------|
| 05.10.2021 | 8:00 am / 4 hours 24 mins | LAX to IAD | 56891 | X-57 | Partly cloudy | Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor incididunt ut labore et dolore magna aliqua. Ut enim ad minim veniam, quis nostrud exercitation ullamco laboris | Luke Skywalker | |
| 05.12.2021 | 9:24 am / 3 hours 6 mins | DEN to ORD | 12563 | X-57 | Rain, drizzle | Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor ut | Princess Leia | |
| 08.26.2021 | 1:10 pm / 1 hour 48 mins | ATL to DFW | 45123 | X-57 | Partly cloudy | Lorem ipsum dolor sit amet, consectetur adipisicing elit, sed do eiusmod tempor | Hans Solo | |
| 09.01.2021 | 3:50 pm / 2 hours | CHI to HOU | 74621 | X-57 | Clear skies | Lorem ipsum dolor sit amet, consectetur adipisicing elit | Chewbacca | |



AERONAUTICS FLIGHT LOG

NEW FREQUENT FLYER NUMBER: 0000000001

NAME

FLIGHT LOG

BOARDING PASS

MAPS

LEARN MORE

DO MORE STEM



FLIGHT LOG

ABOUT FLIGHT LOGS

ENDORSEMENTS

MISSION PATCHES

VIDEOS



The holder of this Flight Log has earned the following endorsements.

Endorsement Type: Junior Pilot Badge

Date: August 26, 2021

Expiration: August 26, 2022

Instructor: April Lanotte

Endorsement Type: Expert Pilot Badge

Date: August 26, 2021

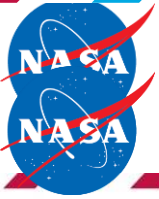
Expiration: August 26, 2022

Instructor: April Lanotte

ENTER ENDORSEMENT CODE

AERONAUTICS “Do More STEM”

- Access to STEM lessons and activities
 - Also includes elementary level activities based on flight logs and mapping (middle and high school activities coming soon)
 - [NASA Flight Log STEM Learning Module](#)
 - [Orville D. Squirrel's Flight Log](#)
 - Students can print out and take Orville with them on a trip
- Endorsement codes are embedded in available activities
 - More being added all the time
 - Activities in English and Spanish



AERONAUTICS FLIGHT LOG

NEW FREQU

LOG BOARDING PASS MAPS LEARN MORE DO MORE STEM



NASA Aeronautics for Educators

Private group · 2.4K members

Join Group

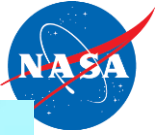
About Discussion

NASA Aeronautics for Educators (Facebook)



X-59





AERONAUTICS

Mission Patches available soon!!

FLIGHT LOG

ABOUT FLIGHT LOGS

ENDORSEMENTS

MISSION PATCHES

VIDEOS

Earn your mission patches by participating in a flight for the missions shown below. Once you participate, your patches will be shown in color.



AAM PATCH
COMING SOON

NASA Express emails



EXPRESS

The NASA Education EXPRESS message features updates from NASA and STEM associates.

Sign up at

www.nasa.gov/education/express

Join Us



Join our
*NASA Aeronautics for
Educators* Facebook
page and
Sign up for our monthly
STEM newsletter:
[https://forms.gle/BGETSk
pgMiNc4Sqv9](https://forms.gle/BGETSkpgMiNc4Sqv9)

Share teaching techniques, lessons, activities and ideas about aeronautics
Learn about aeronautics research—NASA programs, careers, X-planes, and more